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Review

Knowledge, attitudes, and practices regarding cancer screening and primary prevention among ethnic minorities in mainland China: A literature review

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ABSTRACT

Objective: Cancer screening and primary prevention are effective strategies for addressing the burden of cancer. However, cancer health disparity exists in accessing cancer screening services among ethnic minorities in mainland China. Exploring knowledge, attitudes, and practices regarding cancer screening and primary prevention is an effective way to understand minority groups' participation in these activities and the barriers to their participation. However, no review has summarized the relevant evidence. This study explored the evidence on cancer screening and primary prevention among ethnic minorities in mainland China, including their knowledge (knowledge level and awareness rate), attitudes (positive/negative attitudes, beliefs, and perceptions), and practices (uptake and participation rate).

Methods: Five online databases (MEDLINE, EMBASE, PubMed, China National Knowledge Infrastructure [CNKI], and Wanfang Data) were searched to identify literature. Data on knowledge, attitudes, and practices regarding cancer screening and primary prevention among ethnic minority groups and the influential factors were extracted and summarized.

Results: Twelve articles on studies with a total of 36,464 participants were included. Most of the studies focused only on breast and cervical cancer, women, and Uyghurs. The ethnic minority groups in the reviewed studies had a low level of knowledge about cancer screening and primary prevention and insufficient practices (cancer screening and primary prevention service uptake rate $< 40.0\%$) but moderate to highly positive attitudes.

Conclusions: This review revealed the insufficient knowledge and practices of cancer screening and primary prevention among ethnic minority groups in mainland China, whose members hold generally positive attitudes toward screening. More evidence pertaining to diverse ethnic minority groups and other cancer types is needed.

Introduction

Cancer is a major public health problem and the second leading cause of death worldwide.[1] In 2020, more than 19.29 million new cases of cancer were reported worldwide, with an incidence rate of 247.5/100,000, and there were 9.96 million cancer-related deaths, with a mortality rate of 207.5/100,000.[2] The cancer burden was greatest in China, which accounted for 23.7% of all new cases (4.57 million new cases, incidence rate = 315.6/100,000) and 30.2% of all cancer-related deaths (3.00 million deaths, mortality rate = 127.8/100,000) worldwide in 2020.[2] The cancer burden is expected to continue to increase because of increases in population size and aging, with estimates projecting approximately 6.84 million new cases and 5.07 million related deaths in 2040.[3] To release the global cancer burden, the World Health Organization calls on all countries and regions to take active measures to conduct cancer screening and promote healthy lifestyles to the public as up to 50% of cancer can be prevented via a healthy lifestyle (i.e., primary prevention) and early cancer detection (i.e., secondary prevention).[4,5]

China is a multiethnic country comprising a Han Chinese majority (91.11%) and 55 ethnic minority populations (8.89%).[6] The ethnic minority population in China is 125.31 million in 2020, with a significant population increase of 2.07 times that of the Han population (11.92% vs. 5.77%) since 2010.[7] China's ethnic minority populations mainly live in concentrated communities in western and border areas which have lagged

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behind eastern and central China in terms of socioeconomic development.[8] Most of them live in rural areas and tend to use their own spoken and written language.[9]

The Chinese government has launched a series of policies to reduce the burden of cancer and to achieve goals of Health China 2030,[10] such as the free screening program for the "two cancers" (i.e., breast and cervical cancer) for rural women who aged 30–65 from 2009; the free screening program for five common cancers (i.e., lung, breast, liver, colorectal and upper gastrointestinal tract cancer) for urban residents from 2012.[11,12] However, the cancer health disparity still exists, especially the uptake of cancer screening was substantially lower among ethnic minority populations in mainland China than among Han populations in the same demographic location and with the same access to free cancer screening services. A large-scale survey with 3900 participants, conducted in Xinjiang, demonstrated that only 18.0% and 4.5% of Uyghur women had received cervical smear tests and HPV examinations which were free of charge by the government; this rate was much lower than those reported among Han women (31.0% and 11.0%, respectively).[13]

In addition to external issues such as economic factors, distance, and the availability of screening services, individuals' knowledge and awareness may influence their adoption of healthy behaviors. These relationships may be mediated by the individuals' attitudes according to knowledge, attitude, and practice (KAP) theory, which is widely used in the investigation and promotion of health behaviors.[14–16] A meta-analysis of seven studies with a total of 4909 participants demonstrated that women's knowledge about cervical cancer was significantly related to their uptake of screening (odds ratio [OR]: 4.81; 95% confidence interval [CI]: 3.06, 7.54).[17] Systematic reviews also have demonstrated that a lack of knowledge about cancer and a negative attitude toward cancer screening and primary prevention services might negatively affect cancer screening uptake among ethnic minority populations based on the studies' results from Hong Kong SAR, the United States, the United Kingdom, and Canada.[18,19] However, there is no systematic review and consistent evidence regarding KAP outcomes in ethnic minority populations in mainland China.

This review was conducted to summarize the evidence of KAP regarding cancer screening and primary prevention among ethnic minority populations in mainland China. It is intended to provide a better understanding of the conditions of these populations and the formulation of effective and feasible measurements to increase their cancer screening uptake healthy behaviors related to cancer prevention, which can result in increases in early detection and early treatment, and improvements in prognosis.

Methods

The KAP model has been used to explore what is known, believed, and done in relation to cancer control in populations, which emphases the significant impact of knowledge and attitudes on individuals' behaviors.[14–16] In this review, it was used to define the operational outcomes as follows. **Knowledge** refers to what is known by the participants about cancer screening and primary prevention, including (1) their awareness rate, defined as preliminary awareness of the existence of cancer and screening and prevention services; and (2) their knowledge level, defined as the depth of understanding and health literacy regarding cancer screening and primary prevention. **Attitude** refers to the participants' responses to cancer screening and primary prevention statements and services, including their negative and positive attitudes, beliefs (e.g., endorsement of benefits/harm to their health), and perceptions (e.g., perceived needs, willingness, and acceptability). **Practice** refers to the participants' adoption of and participation in behaviors related to cancer screening (e.g., uptake of cancer screening) and primary prevention (i.e., their uptake of vaccination and their practice of healthy behaviors related to cancer prevention).

Search strategy

Five online databases were searched for relevant literature: three common electronic databases (MEDLINE, EMBASE, PubMed) and two Chinese language databases (China National Knowledge Infrastructure [CNKI] and Wanfang Data). The following search terms were used: "knowledge," "awareness," "attitudes," "belief," "acceptance," "acceptability," "participation," "uptake," "perception," "cancer screening," "cancer prevention," "minority ethnic," "minority nationality," "nationality," and "minority." The search strategies are listed in Table 1.

Study selection

EndNote 20 was used to automatically delete duplicate articles, after which two researchers (ZWQ and LHY) performed manual deduplication. The titles and abstracts of the remaining articles were screened directly, followed by further full-text screening to determine eligibility. Studies eligible for inclusion met the following criteria: (1) descriptive studies with quantitative data collection and analysis that (2) targeted ethnic minority populations in mainland China (i.e., at least one main group was an ethnic minority population with subgroup analysis results report; or more than 70% proportion) and (3) measured KAP regarding cancer screening and primary prevention and at least one outcome related to knowledge or attitude. Studies were excluded if they (1) had no full text available or (2) were conducted outside mainland China. The reference lists of identified systematic reviews and other literature were also screened to identify additional eligible studies. To ensure the timeliness of the evidence in this review, we only included studies published within the past 10 years.

Data extraction and analysis

Data on the study characteristics were extracted from individual articles by one researcher (ZWQ) and checked by a second researcher (LHY); the data included the (1) research design (i.e., study setting, study design, and cancer type of focus), (2) participants (i.e., sociodemographic and clinical characteristics such as age, educational level, sample size), (3) study outcomes and instruments used, and (4) main research findings. We were unable to conduct a meta-analysis to obtain conclusive findings because the included studies reported a diverse range of measurement tools. Therefore, a data synthesis was conducted to summarize the results of the included studies.

Table 1
Search strategy (example of PubMed & CNKI).

Database	Search strategy
PubMed	#1 = "knowledge"[Title/Abstract] OR "awareness"[Title/Abstract] OR "participation"[Title/Abstract] OR "uptake"[Title/Abstract] OR "attitudes"[Title/Abstract] OR "belief"[Title/Abstract] OR "acceptance"[Title/Abstract] OR "acceptability"[Title/Abstract] OR "perception"[Title/Abstract] #2 = "cancer screening"[Title/Abstract] OR "cancer prevention"[Title/Abstract] #3 = "ethnic minority "[Title/Abstract] OR "minority nationality"[Title/Abstract] OR "nationality"[Title/Abstract] OR "minority"[Title/Abstract] #4 = "Chinese"[Title/Abstract] OR "China"[Title/Abstract] #5 = #1 AND #2 AND #3 AND #4
CNKI	(SU = '癌症筛查' + '癌症预防' + '癌症防治') AND (SU = '认知' + '知识' + '认识' + '意识' + '参与度' + '接受度' + '行为' + '态度')

Results

A total of 1248 citations were identified in the literature search. After we removed duplicates and screening titles and abstracts, 14 articles remained. Two more articles were excluded after full-text screening because of a lack of a full text or ethnic records. Finally, 12 articles describing studies with a total of 36,464 participants were included and analyzed in this review.[13,20–30] The article selection process is shown in Fig. 1.

Characteristics of the included studies

The characteristics of the included studies, such as the research design, participants, outcomes, and instruments, are summarized in Table 2.

Research design

All of the included studies conducted a cross-sectional survey. Most (91.6%) were conducted in regions of mainland China inhabited by minority populations, including Xinjiang (n = 9),[13,23–30] Inner Mongolia (n = 1),[22] and Qinghai (n = 1).[20] Only one study was conducted in Beijing, the capital of China.[17] Ten studies focused on cervical cancer screening and primary prevention,[13,21,22,24–30] one focused on breast cancer,[23] and the last included all cancer types.[20] The sample sizes of the studies ranged from 493 to 17,167, and 50% of the studies included more than 1000 participants.[13,22,23,26,28,30]

Participants

Eight studies included only female participants from populations such as undergraduate students,[21] general local residents,[22,23,26,28,30] and patients with cervical cancer.[13,27] Two studies focused on men in the general population,[24,29] and the remaining two studies had no gender restrictions.[20,25] Most of the included studies reported a participant age range of 30–65 years[22,26] or a mean age of 40–50 years,[20,24,25,27,28,30] although two studies focused on undergraduate students aged 16–22 years.[21,25] Only one study included participants with an age range of 16–60 years,[13] and another did not report the ages of the participants.[29] Regarding the education level, many to all of the participants (42.9%–100.0%) only had a high school degree or below. Five studies set restrictions on the participants' residential location: four only included rural populations,[23,26,28,29] while one focused on an urban population.[20] The following ethnic minority groups were investigated in the included studies: Uyghur (n = 10),[13,21,23–30] Mongol (n = 2),[21,22] Hui (n = 2),[20,21] Kazakh (n = 1),[23] Korean (n = 1),[21] Tibetan (n = 1),[21] and Tujia (n = 1).[21] Five studies also included local members of the Han ethnic population for comparison.[13,20–23]

Outcomes and instruments

Knowledge. Six studies measured the participants' professional knowledge and health literacy regarding cancer screening and primary prevention, using scored questionnaires and correct answer rates.[20,21,23,25,27,28] Ten studies measured the participants' awareness of cancer screening and primary prevention-related topics such as cervical cancer screening methods, breast self-examination strategies, early detection and diagnosis of cancer, risk factors for cervical cancer, HPV, HPV as a causal factor in cervical cancer, HPV testing, HPV vaccination, and cervical smear testing using scores calculated from yes/no responses to questionnaire items.[13,20–26,29,30]

Attitudes. Seven studies measured the participants' attitudes toward cancer screening and primary prevention statements and services, including their perceived acceptability of cervical cancer screening and vaccination,[21] positive attitudes toward breast self-examination,[23] belief in early breast cancer screening,[23] positive or negative attitudes toward the importance of cervical cancer screening,[24] perceived willingness to receive or support their wife and/or female children in receiving cervical cancer screening and HPV vaccines,[22,24,29,30] and perceived need or desire for knowledge about general cancer prevention and treatment.[20,21]

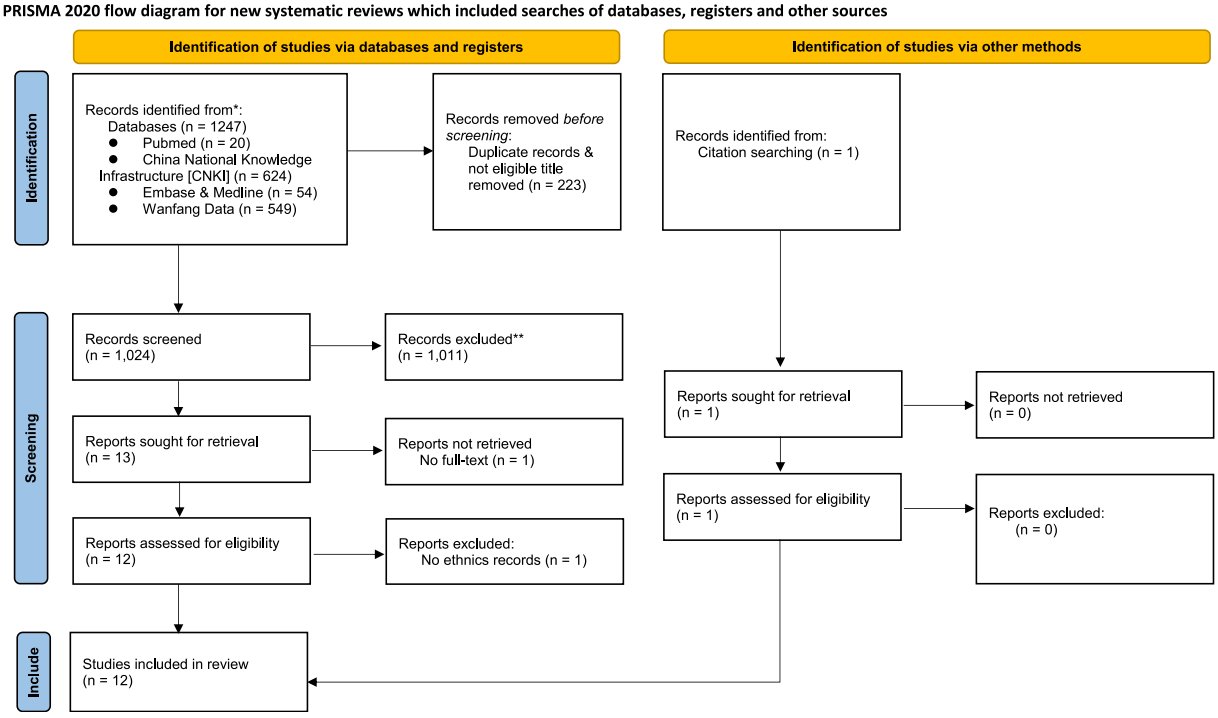

Fig. 1. Flow diagram illustrating the original process of screening and identification of studies. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71. For more information, visit: http://www.prisma-statement.org/.

Table 2
Characteristics of included studies and main results ($N = 12$).

Authors	Study setting	Study design	Cancer type	Participants		Outcomes (Instruments)	Main research findings	
				General characteristics	Nationality (Sample size)		KAP Status	Influencing factors on KAP
Wu et al., (2017)[21]	A national-level university, Beijing	Cross-sectional	Cervical cancer	First- and second-year female undergraduate students; 16–26 years old; 60.2% of them were from urban areas	6 minority ethnic groups[a], [i.e. Korean (81), Mongolian (77), Uyghur (54), Tibetan (48), Hui (21), Tujia (20), Han (123), and others (69)] Total: 493	Knowledge and awareness of, and attitudes to cervical cancer screening and prevention (Self-designed questionnaire)	1) The overall knowledge level of cervical cancer and prevention was very low (mean score of 2.35 ± 1.82, range: 0–8 scores); Han ethnic showed the highest knowledge scores (mean score of 2.94 ± 1.82), and Korean students had the lowest (mean score of 1.95 ± 1.51) 2) 78.9% (80.3% in minority group, 75.0% in Han group) of students had never heard of HPV, and only 7.9% (6.5% in minority group, 12.2% in Han group) knew the disease that HPV could cause. Only 28.0% knew the prevalence, and only 19.7% knew interventions for cancer prevention; 3) 63.3% and 61.1% of students expressed perceived acceptability of cervical cancer screening and vaccination. Tujia ethnic had the highest acceptance of cervical cancer prevention (75.0% accepted screening and 65.0% accepted vaccination). Perceived acceptability of cervical cancer prevention was lowest among Tibetans (47.9% and 45.8% accepted screening and vaccination, respectively). Tibetan, Uyghur and Korean	1) Ethnicity was the factor most associated with cervical cancer knowledge scores, perceived acceptability of cervical cancer screening; 2) Shortage of knowledge; concerns about safety, effectiveness, and price; less acceptance of general screening exams and interest were the main factors against the participants' acceptability of both cervical cancer screening and vaccination; 3) The information source was independently associated with cervical cancer knowledge level, the information source of friends or family and books and magazines were the most associated with high cervical cancer knowledge scores, when compared with those who had no information sources.

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							showed significantly less acceptability than Han ethnicity. 4) 65.1% of the students expressed a desire to obtain more HPV and cervical cancer knowledge. However, approximately 50% of the students had no information sources about cervical cancer, among the last half of them the most commonly used was the internet (47.7%).	
Li. (2016)[23]	Yili Kazakh Autonomous Prefecture and Altay Region, Xinjiang	Cross-sectional	Breast cancer	Rural females; 35–65 years old, 77.6% < 45 years old; 60.6% of them had a junior high school degree or below	Kazakh (1564), Uyghur (782) & Han (732) Total: 3078	Knowledge and awareness of, attitude to, and participation in breast cancer early screening and prevention (Self-designed questionnaire)	1) 94.5% of the participants had heard about breast cancer early screening, among which 51.9% through healthcare professionals; 2) Participants showed a medium level of knowledge of breast cancer screening and prevention (mean scores of 8.51 ± 3.06, range: 0–15 scores). The correct rate of the 15 questions of knowledge ranged from 33.2% to 74.0%; The awareness rate of breast cancer risk factors (i.e., obesity, high-fat diet and estrogen) in Han Chinese was significantly higher than that of other ethnic groups; The awareness rate of breast self-examination in Kazakh was significantly lower than that of other ethnic groups (χ^2: 11.12–368.42, $P < 0.01$); 3) Participants showed a medium to high degree of positive attitude toward breast self-examination (mean scores of 13.12 ± 2.18, range: 4–16 scores). Most	1) Rural women who were aged over 45 years old, of Han ethnicity, living in the county, and had children or breast disease history showed a higher level of knowledge of breast cancer early screening when compared with those below 45 years old, Kazakh or Uyghur ethnicity, living the villages, without disease history; 2) Rural women who held higher education levels, and had reproductive history and family history of cancer showed more positive attitudes toward breast self-examination when compared with those who had lower educational levels and disease history; 3) Rural women who were of Han ethnicity, employed, more

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	considered breast self-examination worthwhile (90.8%) and important to health (95%), and expressed interest (88.4%); 4) 80% of Han ethnicities knew how to self-examine, followed by Kazakh (57%) and Uyghur (51%). 64.3% of Han ethnicities had undergone self-examination, while Kazakh had the least, with only 25.3%; 5) 43.6% of Han women had undergone breast clinical examination within 1 year while only 22.7% in Uyghur. 42.3% of Uyghur and 35.3% of Kazakh women had not undergone breast clinical examination; 6) Participants showed a mediate degree of beliefs for breast cancer early screening, including perceived susceptibility of breast cancer (mean scores of 14.10 ± 3.05, range: 4–20 scores), perceived severity of the breast cancer (mean scores of 25.22 ± 4.92, range: 7–35 scores), perceived benefit of breast cancer early screening (mean scores of 26.36 ± 3.99, range: 7–35 scores), and perceived screening barriers (mean scores of 54.53 ± 16.05, range: 19–95 scores); 7) 83% of the participants believed that if doctors recommend early screening, they would probably do it.	accessible to the screening services, had medical insurance, history of breast diseases and higher scores in positive attitudes, had a higher adoption rate in breast self-examinations when compared with those who were Kazakh or Uyghur ethnicity, unemployed, had less accessible to the screening services, had no medical insurance, history of breast diseases and a lower score in positive attitudes; 4) Postmenopausal women and women who knew more about early screening knowledge were more likely to experience breast cancer susceptibility. Postmenopausal women and women who knew more about early screening knowledge and had a family history of cancer were more likely to perceive the breast cancer severity. Women who had a reproductive history and knew more about early screening knowledge were more likely to perceive the benefits. Women who lived in

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								countries, were of Uyghur ethnicity, had a family history of cancer, had the opportunity to participate in breast cancer health examination, and knew more about early screening knowledge were less likely to perceive the screening barriers.
Zhang et al., (2018)[22]	Ordos, Inner Mongolia Autonomous Region	Cross-sectional	Cervical cancer	Females who participated in cervical cancer screening (no cancer history); 35–64 years old; 50.7% (Mongolian) and 62.0% (Han) of them had a junior high school degree or below	Mongolian (2127) & Han (15,040) Total: 17,167	Awareness of, willingness to receive, and participation in cervical cancer screening (Self-designed questionnaire)	1) More than 80% of the Han and Mongolian heard about cervical cancer screening, but 42.0% of the two groups did not know the screening methods (i.e., HPV test); More Han Chinese heard about cervical cancer screening, HPV virus and vaccination than Mongolians (χ^2: 22.52–45.27, $P < 0.05$); 2) The main sources from which Han and Mongolian women obtained information about cervical cancer screenings were family members or friends (40.9% in Han, 43.2% in Mongolian), followed by media or public service announcements (31.0% in Han, 26.8% in Mongolian); 3) Only 37.3% of Han and 40.3% of Mongolian women had undergone cervical cancer screening within the past three years, 33.1% of Han and 33.9% of Mongolian women had never	1) Both Mongolian and Han women who were younger, had higher education levels, had a history of reproductive tract, and had insurance coverage showed a significantly higher awareness rate of cervical cancer screening methods, while unemployed women had a significantly lower awareness rate ($P < 0.05$); 2) Both Mongolian and Han women with higher education, a history of the reproductive tract, and younger age showed a significantly higher awareness rate of the HPV virus ($P < 0.05$); 3) Mongolian women who were younger showed a higher awareness rate of cervical cancer vaccines ($P < 0.05$);

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							received cervical cancer screening; 4) Approximately 66.0% of Han and Mongolian women were willing to undergo annual screenings; Around 50.0% of the two groups had the willingness to let their children accept HPV vaccination.	4) Participants with a history of reproductive tract and cancer disease showed significantly more willingness to accept HPV vaccination ($P < 0.05$).
Ayizuoremu et al., (2015)[13]	Xinjiang	Cross-sectional	Cervical cancer	Female cervical cancer patients; 16–60 years old; 51.6% (Uyghur) and 42.9% (Han) of them had a high school degree or below	Uyghur (1900) & Han (2000) Total: 3900	Awareness of cervical cancer, HPV virus and HPV vaccination, participation in cervical cancer screening (Self-designed questionnaire)	1) The awareness rates of cervical cancer, HPV and HPV vaccination were 25.0%, 8.0% and 4.0% among Uygur women and 35.0%, 19.0% and 7.0% among Han women; 2) The primary sources to hear about cervical cancer were television and friends among Uyghur (34.1%, 33.1%) and Han women (35.7%, 27.3%); 3) The awareness rates of high-risk factors of cervical cancer among Uygur and Han women were 15.6% and 26.5%, respectively; 4) The proportions of receiving cervical smear tests among Uygur and Han women were 18.0% and 31.0%, respectively; 5) The proportions of receiving HPV examination among Uygur and Han women were 4.5% and 11.0%, respectively.	1) Uyghur women with lower educational levels showed significantly lower awareness rates of cervical cancer, HPV and HPV vaccination (χ^2: 7.42–39.63, $P < 0.05$).
Wang et al., (2022)[20]	Community health centres, Xining, Qinghai	Cross-sectional	All cancer	Urban residents; Mean age of 44.41 (SD = 15.45) years old (ranged from 19 to 89); 54.0% of them were females; 70.1% (Hui) and 56.6% (Han) of them had a high school degree or below	Hui (211) & Han (422) Total: 633	Health literacy and awareness of cancer prevention, early detection, early diagnosis, early treatment, and perceived needs for knowledge of prevention and treatment (Questionnaire on health	1) The health literacy of cancer prevention and treatment among Hui residents in Xining was poorer than that among Han residents (correct rate: 58.3% vs 66.6%, $\chi^2 = 4.19$, $P < 0.05$);	1) Hui residents who were females, were employees of public institutions/civil servants/state-owned enterprises, and reported

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						literacy of cancer prevention and treatment for urban residents[b])	2) Hui residents' awareness of early detection and early diagnosis of cancer, and perceived needs for knowledge of cancer prevention and treatment were lower than those of Han residents ($P < 0.05$).	themselves to be a risk of cancer showed a significantly higher level of health literacy in cancer prevention and treatment.
Cai et al., (2013a)[30]	Xinjiang	Cross-sectional	Cervical cancer	Female residents; Mean age: 43.7 years old (ranging from 21 to 72); 97.4% of them had a junior high school degree or below	Uyghur Total: 1042	Awareness of cervical cancer- and HPV, willingness to receive cancer screening tests, and participation in cervical smear tests (Self-designed questionnaire)	1) 37.91% knew cervical cancer, out of which 34.94% learned about cervical cancer mainly through television, and then neighbours (28.86%), and doctors/nurses (10.13%); 0.48% knew the risk factors of cervical cancer, 10.08% knew the cervical smear test, none of them knew about HPV and HPV vaccination; 2) 99.14% showed willingness to receive screening tests; 3) Only 6.33% have ever received cervical smear test, 73.03% of women have ever had gynaecological examinations.	1) Educational level positively impacts the awareness of cervical cancer, risk factors of cervical cancer, cervical smear test, and significance of cervical smear test ($P < 0.01$).
Cai et al., (2013b)[29]	Xinjiang	Cross-sectional	Cervical cancer	Rural males; 63.21% of them had a high school degree or below	Uyghur Total: 648	Awareness of cervical cancer and HPV, willingness to have female families receive cancer screening tests (Self-designed questionnaire)	1) Only 4.32% of the participants knew about cervical cancer, and the main sources to obtain the related health information were television/radio (92.68%), and doctors/neighbours/ families (7.14%). None of them knew the risk factors of cervical cancer, cervical smear tests and HPV vaccination, only two heard about HPV; 2) 93.21% of men were willing to have their wives and children for gynaecological examinations.	1) Educational level positively impacts the awareness of cervical cancer, the risk factors of cervical cancer and the significance of regular cervical cancer screening ($P < 0.01$).

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Guzanur et al., (2015a)[25]	Xinjiang	Cross-sectional	Cervical cancer	Year three medical undergraduate students; Mean age of 20.14 (SD = 1.01) years old (ranged from 20 to 22) 55.7% of them were females	Uyghur Total: 253	Knowledge and awareness of cervical cancer and HPV (Self-designed questionnaire)	1) Only 26.8% (female: 17.8%, male: 9.1%) of the participants knew cervical cancer, and only 17.0% of them (female: 21.0%, male: 4.0%) knew HPV; 2) The correct rate of knowledge about cervical cancer, risk factors of cervical cancer, HPV and HPV vaccination is 8.3%–17.0% (female: 7.1%–22.0%, male: 7.1%–19.6%);	1) Gender was the main influence factor, females showed a better awareness and knowledge of cervical cancer and HPV than males ($P < 0.05$).
Sui et al., (2015)[27]	Xinjiang	Cross-sectional	Cervical cancer	Females diagnosed with cervical cancer for the first time; Mean age of 49.62 (SD = 10.56) years old (ranged from 27 to 79); 89.07% of them had a high school degree or below	Uyghur Total: 238	Knowledge of cervical cancer, and participation in cervical cancer screening (Self-designed questionnaire)	1) Only 22.69% of the participants got 6 or above scores (0–10 scores) about cervical cancer-related knowledge, 42.02% of them only got 1 or 0 scores; 2) 65.55% of them never received a cervical smear test, and only 12.18% received once within three years;	–
Zhu et al., (2015)[28]	Xinjiang	Cross-sectional	Cervical cancer	Rural females; Mean age of 40.5 (SD = 7.6) years old (ranged from 30 to 59); 82.2% of them had a junior high school degree or below	Uyghur Total: 2552	Knowledge of cervical cancer prevention and treatment and its influencing factors (Cervical cancer prevention and treatment knowledge questionnaire provided by the National Cervical Cancer Early Diagnosis and Treatment Project Team)	1) The correct rate of the participants for the items was 3.0%–64.9% (average: 34.8%), only 3.0% knew HPV is the necessary cause of cervical cancer.	1) Participants with higher educational levels, higher annual income, and with history of reproductive tract and cancer disease or family history of cervical cancer showed significantly better knowledge of cervical cancer and its prevention
Guzanur et al., (2015b)[26]	Xinjiang	Cross-sectional	Cervical cancer	Rural females; 75.7% 30–60 years old; 96.7% of them had a high school degree or below	Uyghur Total: 6000	Awareness of cervical cancer and HPV, and participation in cervical cancer screening (Self-designed questionnaire)	1) 84.8% of the participants did not knew about cervical cancer, 97.8% of them had no idea about HPV, 66.0% of them did not know the risk factors of cervical cancer. Only three people knew HPV is the screening strategy for cervical cancer, and the main sources to obtain the related health information were doctors/nurses	1) Women with a family history of cancer, and those who have had a gynaecological examination and smear test had a lower risk of low awareness.

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							(46.7%) and television (41.7%); 2) 24.5% of the participants had ever received a cervical smear test (mainly due to existing symptoms, and the doctor's advice); 3) 86.9% of the participants had ever received a gynaecological examination.	
Miherinisha et al., (2016)[24]	Xinjiang	Cross-sectional	Cervical cancer	Male residents; Mean age: 43.6 years old (ranged from 21 to 83; 92.0% of them had a high school degree or below	Uyghur Total: 460	Awareness of cervical cancer and HPV, attitudes to the cervical cancer screening (Self-designed questionnaire)	1) The overall awareness rate of cervical cancer was low. 44.1% of the participants knew the cervical cancer, mainly through television (41.4%) and others (22.7%). 17.2% of them knew the risk factors of cervical cancer. 7.6% knew HPV, 2.8% knew HPV vaccination; 2) 37.0% of the participants thought their wives' uptake of cervical smear tests was important, while 37.2% thought it unimportant, 78.9% showed willingness to let their wives uptake the cervical smear test once a year.	1) The education level and occupation positively influenced the awareness of cervical cancer, attitude on cervical cancer smear tests, and awareness of HPV. People who had a college diploma or above and worked as workers or cadres showed a higher awareness of cervical cancer and HPV than those who were self/un-employed or farmers, and had an educational degree of high school or below.

HPV, Human papillomavirus.

[a] Minority ethnic groups except Han.

[b] developed and validated by the National Cancer Centre.

Practice. Six studies measured the participants' practices regarding cancer screening and/or prevention activities, including the adoption of breast self-examination and clinical exanimation[23] and the uptake of gynecological examination, HPV testing, and cervical smear testing.[13,22,26,27,30]

Instruments. Only two studies used questionnaires recommended by official organizations. Wang et al. (2022) used the questionnaire on health literacy about cancer prevention and treatment for urban residents developed and validated by the National Cancer Center of China to measure the participants' health literacy about cancer prevention and treatment, awareness of early detection and early diagnosis, and perceived need for knowledge.[20] Zhu et al. (2015) used the cervical cancer prevention and treatment knowledge questionnaire provided by the National Cervical Cancer Early Diagnosis and Treatment Project Team to measure the participants' knowledge of cervical cancer prevention and treatment.[28] The other 10 studies used self-designed questionnaires to measure the participants' knowledge, awareness, attitudes, beliefs, and perceptions regarding cancer screening and primary prevention and their participation in these activities.[13,21–27,29,30]

Main research findings

The main research findings, including the status of and factors influencing KAP among the participants, are summarized in Table 2.

Knowledge of cancer screening and primary prevention

Eight studies reported the sources used by members of ethnic minority groups to obtain health-related knowledge and information. The most commonly used sources were television, radio, and internet (26.8%–92.68%),[13,21,22,24,26,29,30] followed by healthcare professionals (10.13%–51.9%)[23,26,30] and friends, family members, and neighbors (22.7%–43.2%).[22,24,30]

Knowledge level. The participants exhibited an insufficient knowledge of cancer screening and primary prevention. Among the 493 undergraduate students (ethnic minority proportion: 61.5%), the participants had a very low mean score on a cervical cancer-related knowledge questionnaire (2.35; maximum score = 8).[21] In another study, 3078 participants (ethnic minority proportion: 76.2%) had a moderate mean score of 8.51 (standard deviation [SD] = 3.06) on a questionnaire of knowledge regarding breast cancer screening and primary prevention with a possible score range of 0–15.[23] Only 22.69% of 238 Uyghur female cervical cancer patients demonstrated an understanding of cervical cancer-related knowledge, indicated by a score of ≥ 6 with a possible maximum of 10, while 42.02% received a score of only 0 or 1.[27] Hui patients showed poor knowledge about general cancer screening and primary prevention, with a correct rate of 58.3% (correct response number/total number, expected correct rate: $\geq$ 80%).[20] Among 253 Uyghur female patients with cervical cancer, the rates of correct responses to test items about cervical cancer, HPV, and HPV vaccination knowledge ranged from only 8.3%–17.0%.[25] Another study reported an average correct response rate of 34.8% among 2552 Uyghur women in a rural population.[28]

Three studies compared the knowledge levels of different ethnic populations and demonstrated that members of minority ethnic groups had significantly lower levels of knowledge about cancer screening and primary prevention than did members of the Han major ethnic group (correct rate: $\chi^2 = 4.19$, $P < 0.05$[20]; scores: $t = 444.75$, $P < 0.01$[23]; $P < 0.05$[21]).

Awareness. The participants exhibited insufficient awareness of cancer screening and primary prevention. The awareness rates regarding breast self-examination strategies were 57.0% and 51.0% among members of Kazakh and Uygur ethnic populations, and these were lower than the rate of 80.0% in a Han ethnic population.[23] Among the 493 non-medical undergraduate students (ethnic minority proportion = 61.5%) in Beijing, only 21.1% (19.7% in minority group, 25.0% in Han group) had heard of HPV, and only 7.9% (6.5% in minority group, 12.2% in Han group) knew that HPV could cause cervical diseases.[21] Medical undergraduate students from ethnic minority populations in Xinjiang had low awareness rates of 26.8% and 17.0% regarding cervical cancer and HPV, respectively.[25] In a sample of 17,167 women from Inner Mongolia, more than 80% had heard about cervical cancer, but only 58.0% of them knew about cervical cancer screening strategies (e.g., HPV testing).[22] Three studies of Uyghur women found low awareness rates regarding cervical cancer (15.2%–37.9%), cervical smear testing (0%–10.08%), HPV (0.0%–8.0%), HPV vaccination (0.0%–4.0%), and risk factors for cervical cancer (0.48%–34.0%).[13,26,30] The Uygur men also reported low awareness rates regarding cervical cancer (4.32%–44.1%), HPV (0.3%–7.6%), HPV vaccination (0%–2.8%), and risk factors for cervical cancer (0%–17.2%).[24,29]

Four studies compared the awareness rates of different ethnic populations and demonstrated that members of minority ethnic groups had significantly lower awareness rates (number of 'Yes' response/number of 'Yes'/'No' questions) regarding cancer screening- and prevention-related topics than did members of the Han ethnic group (χ^2: 11.12 to 368.42, $Ps < 0.05$).[13,20,22,23]

Attitudes toward cancer screening and primary prevention

Positive attitudes. The participants showed moderately to highly positive attitudes toward breast self-examination (mean score = 13.12, SD = 2.18, possible score range: 4–16) and a very high level of related interest (88.4%), with high rates of agreement regarding the value (90.8%) and importance of such examination (95.0%).[23]

Beliefs. The participants held moderately strong beliefs regarding breast cancer susceptibility (mean score = 14.10, SD = 3.05, score range: 4–20) and severity (mean score = 25.22 $\pm$ 4.92, score range: 7–35), as well as the benefits of (mean score = 26.36 $\pm$ 3.99, score range: 7–35) and barriers to early breast cancer screening (mean score = 54.53 $\pm$ 16.05, score range: 19–95).[23]

Perceptions. Approximately 63.3% and 61.1% of non-medical undergraduate students perceived that cervical cancer screening and vaccination were well accepted, respectively.[21] Approximately 66.0% of Mongolian women in another study expressed willingness to receive cervical cancer screening, and approximately 50.0% of them expressed willingness to let their children receive the HPV vaccine.[22] In a study of 1042 Uyghur women, most (99.1%) were willing to receive screening tests.[30] Two studies reported the attitudes of male participants toward cervical smear tests: 78.9%–93.2% of Uyghur men expressed willingness to support their wives, partners, and female children in receiving free cervical smear tests[24,29] even though only 37.0% of male participants in one study thought that screening was important.[24]

Compared with Han participants, participants from minority ethnic groups expressed varied attitudes toward cancer screening and primary prevention. Specifically, compared with Han participants, the perceived acceptability of cervical cancer prevention was higher among Tujia participants but lower among Tibetan, Uyghur, and Korean participants, who were less accepting of cervical cancer screening and vaccination.[21] In one study, Hui participants expressed lower perceived needs for cancer prevention and treatment knowledge than did Han participants ($P < 0.05$).[20] Uyghur participants in another study expressed the most positive attitude toward breast self-examination, followed by Han and Kazakh participants.[23] Mongolian and Han women expressed similar levels of willingness to receive cervical cancer screening or allow their children to receive the HPV vaccine.[22]

Practice related to cancer screening and primary prevention

The participants were found to have inadequate practices related to cancer screening and primary prevention. Among Uyghur women, the rate of cervical smear test uptake ranged from 6.33% to 34.45%,[13,26,27,30] and only 12.18% of women in one study had received such testing within

the past 3 years.[27] Only 40.3% of Mongolian women had undergone cervical cancer screening within the past 3 years.[22] Another study reported that only 4.5% of participating Uyghur women had received an HPV examination.[13]

Two studies reported significantly lower participation in cancer screening and primary prevention activities among minority ethnic groups than among the Han ethnic group.[13,23] Li et al. (2016)[23] reported that 64.3% of Han participants had performed a self-examination, compared with only 25.3% of Kazakh participants. In the same study, about 43.6% of participating Han women had received a clinical breast examination within 1 year, compared with only 22.7% of Uyghur women.[23] In another study, the proportions of Uyghur women who had undergone cervical smear testing and HPV examination were 18.0% and 4.5%, respectively, lower than the respective rates of 31.0% and 11.0% among Han women.[13] However, a higher uptake of cervical cancer screening among Mongolian women (40.3%) than among Han women (37.3%) was found.[22]

Factors influencing knowledge, attitude, and practice regarding cancer screening and primary prevention among ethnic minority groups

Only two study investigated the inter relationships among the knowledge, attitude and practice in KAP model.[21,23] A lack of knowledge was identified as the main factor hindering students' perceived acceptability of cervical cancer screening and vaccination in one study.[21] Another study demonstrated that rural-dwelling women who had more positive attitudes toward breast self-examination had a higher adoption rate of breast self-examination than other women.[23]

Beyond ethnic diversity and the inter relationship among knowledge, attitude and practice, 11 studies also explored other factors influencing the knowledge, attitude and practice regarding cancer screening and primary prevention respectively among ethnic minority groups.

Factors influencing knowledge. Eleven studies demonstrated that age, gender, education level, employment status, residential area, annual income, reproductive history, disease history, family history of cancer, experience with cancer screening, and information sources were influential factors with respect to knowledge about cancer screening and primary prevention.[13,20–26,28–30]

Six studies that included Uyghur, Mongolian, and Han participants consistently reported that those with a higher education level had a higher level of knowledge and rate of awareness of cervical cancer screening and primary prevention, including topics such as cervical cancer, risk factors for cervical cancer, cervical cancer screening and primary prevention methods, the significance of cervical cancer screening, HPV, and the HPV vaccine.[13,22,24,28–30]

Five studies that included Kazakh, Uyghur, Hui, Mongol and Han (majority ethnicity group, with a proportion of 3.9%) participants consistently reported that participants who had a high risk of cancer, such as those with a personal or family history of cancer or other diseases of the breast or reproductive tract, had a higher knowledge level and rate of awareness of cancer screening and primary prevention, including topics such as early breast cancer screening, cervical cancer screening methods, HPV, the HPV vaccine, and general cancer prevention and treatment.[20,22,23,26,28] One study also pointed out that participants who had experience with receiving cancer screening had a higher awareness of cancer screening and primary prevention than did other participants.[26]

The influence of age on the participants' knowledge level and awareness varied among the ethnic minority groups. Another study of Mongolian women found that younger women had a significantly higher rate of awareness of cervical cancer screening methods, HPV, and the HPV vaccine than older women.[22] Only one study involving the Kazakh, Uyghur, and Han (majority ethnicity group, with a proportion of 23.8%) ethnic groups found that women older than 45 years had a higher level of knowledge about breast cancer early screening than women in other age groups.[23]

Two studies involving the Hui and Uyghur ethnic groups found that female participants had a higher level of knowledge about general cancer prevention and treatment[20] and better awareness and knowledge of cervical cancer and HPV than did male participants.[25] Two studies also demonstrated the important impact of economic conditions, finding that participants with a higher annual income and medical insurance had a higher level of knowledge and awareness of cervical cancer screening and primary prevention.[22,28] Two studies involving the Hui and Uyghur ethnic groups found that the participants' occupation significantly impacted their level of knowledge and awareness of cancer screening and primary prevention.[20,25] Specifically, participants who were employed by public institutions, governments, or state-owned enterprises and those who were laborers, civil servants, or members of leading cadres had a higher level of knowledge about cancer prevention and treatment[20] and a higher awareness of cervical cancer and HPV than those who were self-employed, unemployed, or farmers.[24]

One study reported that rural-dwelling women who lived in counties (i.e., the most advanced rural areas) and had a reproductive history had a higher level of knowledge about early breast cancer screening than women who lived in villages.[23] One study found that undergraduate students who obtained health-related information from their friends and families and from books and magazines had a higher level of knowledge about cervical cancer screening and primary prevention than students who reported having no information sources.[21]

Factors influencing attitudes. Four studies demonstrated that acceptance of general health examinations, disease history, residential area, access to cancer screening services, menopausal status, education level, and occupation were factors influencing participants' attitudes toward cancer screening and primary prevention.[21–24]

Poor acceptance of general health examinations were identified as the main factors hindering students' perceived acceptability of cervical cancer screening and vaccination in one study.[21] Other studies found that participants with a related disease history, such as reproductive tract disease and cancer, were significantly more willing to accept HPV vaccination[22] and to express more positive attitudes toward breast self-examination[23] than were participants without a related disease history. Women who were postmenopausal, had a family history of cancer, and had more knowledge about early cancer screening were more likely to hold beliefs regarding breast cancer susceptibility and severity and the benefits of early breast cancer screening than were women who were premenopausal, had no family history of cancer, and had less knowledge.[23] Women who lived in counties, had a family history of cancer, and had more knowledge about and access to early cancer screening showed obvious less barriers than did those who lived in villages, had no had family history of cancer, and had less knowledge.[23] Men who had a college diploma and were workers or members of leading cadres had a higher awareness of cervical cancer and HPV than men who had a high school diploma or below and those who were self-employed, unemployed, or farmers.[24]

Factors influencing practice. Only one study reported that rural-dwelling women who were employed and had medical insurance, a history of breast disease, and more access to screening services had a higher adoption rate of breast self-examination than other women.[23]

Discussion

This is the first review to summarize KAP regarding cancer screening and primary prevention among ethnic minority groups in mainland China, including Uyghur, Mongol, Hui, Kazakh, Korean, Tibetan, and Tujia groups.

Knowledge of cancer screening and primary prevention

It is difficult to directly compare the participants' knowledge of cancer screening and primary prevention between the studies included in this review because most of the studies used different measurement tools, some of which were self-developed and not validated. Still, the insufficiency of knowledge held by the participants from ethnic minority groups

was obvious, with low to moderate levels of knowledge (e.g., 2.35/8, 8.51/15, correct response rates of 8.3%–58.3%) and low rates of awareness (i.e., < 50.0%) of cancer screening and primary prevention. In contrast, other studies of the ethnic majority group reported moderate to high levels of knowledge and awareness (i.e., 50%–87%).[31–35] The main factors influencing knowledge and awareness in the current review included the participants' education level, annual income, employment status, residential area, and personal or family history of cancer or another disease conferring a high risk of cancer; these findings are similar to those of previous studies of other Chinese populations.[31,33,36]

The results of this review showed that for the participants from ethnic minority groups, the main sources of information about cancer screening and primary prevention were public media such as television, radio, and the internet. Despite these various available sources, however, the ethnic minority participants still had insufficient knowledge. This insufficiency may be related to language barriers between members of the minority ethnic and Han ethnic populations. Members of ethnic minority groups, especially those who are older, may be used to their own ethnic language instead of the official language (i.e., Mandarin).[9] As a result, they may find it difficult to access and understand health information from Mandarin language-based multimedia, such as newsletters, handbooks, and videos, because of language differences. Thus, we recommend that contents of health materials should be understood by ethnic minority groups. (e.g. multilingual, visual content). A group of ethnic minorities can be trained to be community health workers to deal with language barriers.

The low level of knowledge among participants from Chinese ethnic minority groups in the included studies might also be related to the shortage of qualified oncology physicians and nurses who can provide professional education and respond to inquiries about cancer screening and primary prevention in minority-inhabited regions, the majority of which are in rural and border areas.[8] Across China, there are 622,000 village health stations in rural areas. However, most of these stations lack the resources and staff expertise to provide a modern standard of care, let alone professional cancer screening and primary prevention services. Only 26% of the doctors employed at these stations are fully qualified (i.e., possessing nationwide medical practice qualifications and full prescribing rights in medicine), and the stations often lack the supplies and technology to diagnose and treat patients.[37] Therefore, enhancing existing rural health providers' qualifications to provide cancer screening and primary prevention services could facilitate cancer screening and primary prevention and promote and popularize knowledge among ethnic minority populations.

Attitude toward cancer screening and primary prevention

This review demonstrated that members of ethnic minority groups in mainland China held attitudes toward cancer screening and primary prevention that were relatively more positive than negative, as a majority of them (37.0%–99.1%) expressed a willingness and need to receive cancer screening and primary prevention services. This proportion was similar to that among members of the Han ethnic group in this review, as well as the results of a National Cancer Center survey of rural residents in central China (66.35%).[33] This result may be related to free screening programs provided by the government for disadvantaged populations, such as the free screening program for "two cancers" provided to rural women, which makes available free cancer screening for ethnic minority women who live in rural or border areas and face financial difficulties.[38] Members of both Han and ethnic minority groups have expressed a high level of willingness to receive accessible cancer screening and primary prevention services in the absence of financial concerns. The results in this review demonstrate that the level of knowledge about and access to cancer screening services were the main factor influencing the participants' attitudes, demonstrating the importance of increasing not only health education for ethnic minorities in mainland China but also investment in improving accessibility of cancer screening services for these populations.

Practice related to cancer screening and primary prevention

In this review, the participation rate in cancer screening- and prevention-related activities remained lower among ethnic minority groups than among the Han majority group and far from the target set by the National Health Commission, which aims to have a cervical cancer screening rate exceeding 59% among 35- to 64-year-old women by 2025.[39]

The low level of knowledge regarding cancer screening and primary prevention could be the main influence factor causing the low level of participation among ethnic minorities. Furthermore, because of the language barriers, members of ethnic minority groups may experience more problems when applying for appointments for cancer screening services because of communication difficulties with health providers;[18,40,41] this may hinder their participation in cancer screening services and activities. Assistance and support from people in their community who use their language could reduce this barrier.

According this review' result, more positive attitudes toward cancer screening strategies could results in a higher adoption rate of cancer screening activities,[33] which demonstrated the importance of investigation and improvement of the ethnic minorities' attitudes to the government cancer screening and primary prevention policies and calls. Even though, the ethnic minorities in this review showed an equal positive attitudes to the Han regarding receiving cancer screening, their actual actions may be also influenced by religious and cultural factors; for example, Islam is the most common religion practiced among the Uyghur and Hui ethnic groups.[42] Compared with members of the dominant group, members of ethnic minority groups, especially women, may experience greater psychological burdens when exposing their bodies to strangers for cancer screening.[43,44] The acculturation of members of ethnic minority groups in China and their religious practices, such as Islam, Tibetan Buddhism, and ethnic religions, should be given more attention in the future.[18]

In this review, the main influence factor on ethnic minorities' practice could also be whether they had a stable or satisfactory economic condition to cover the medical and other related cost, which could be indicated by official work, stable income, and medical insurance. Potentially additional economic burdens might explain why some ethnic minorities are not willing to undergo cancer screening even when the cost of screening is waived; these may include the costs of transportation and of follow-up examinations and treatment after cancer detection.[45] Therefore, additional financial support, such as medical insurance for cancer treatment, is needed to relieve ethnic minorities' concerns about the uptake of cancer screening.

Mechanism investigation of KAP model

In this review, only two studies investigated unitary relationships among KAP outcomes by using correlation tests, that are: (1) individuals' lack of knowledge could significantly hinder their attitudes to cancer screening and primary prevention issues (i.e., perceived acceptability of cervical cancer screening and vaccination),[21] and (2) individuals who had more positive attitudes (i.e., toward breast self-examination) had a higher participation in cancer screening and primary prevention activities (i.e., adopting breast self-examination).[23] These findings preliminarily explore the positive impacts of knowledge on attitudes, and the attitudes on practice. However, the mechanism of KAP model in ethnic minorities in mainland China remains unclear, as none of the included study investigated the comprehensive mechanism of knowledge/attitudes on practice such as synergistic effect of knowledge and attitude on practice, which are already improved by using model testing in other populations such as women from Southern Ethiopia, Iran and Zambia for cervical cancer screening.[14–16]

Limitations

During this review, we did not contact researchers who had published research abstracts in conference proceedings to ask about the completion of their ongoing studies. The results of our synthesis might also have been impacted by the included studies, which (1) involved only two cancer types and seven ethnic minority groups, (2) used instruments that lacked property testing and validation, and (3) lacked male and older participants. More evidence from a broader range of regions and more ethnic minority populations and age groups is needed to increase the representation and consistency of the results.

Recommendations for future studies

During this review, several research gaps were identified that can be explored in future studies focusing on the KAP regarding cancer screening and primary prevention among ethnic minority groups in mainland China. First, most of the included studies used self-designed questionnaires in Mandarin, with no instrumental validation or property testing, to measure KAP. Valid and reliable measurement tools in the languages used by ethnic minorities are lacking. Future studies could focus on developing a version in target minority language and validating its properties testing in the target ethnic minority group for a better accuracy and acceptability outcomes measuring. Second, the mechanism of KAP model in improving the ethnic minorities in mainland China is still unclear as lack of comprehensive model testing results. Future study could conducted large-scale cross sectional surveys or longitudinal studies with structural equation modeling (SEM) test, as well as the randomized controlled trials to verify the mechanism KAP model among the ethnic minority groups. Third, most studies have focused on ethnic minorities who reside in mainly minority-inhabited regions. Few studies have explored ethnic minorities in non-minority-inhabited regions, who may encounter additional cultural conflicts and language barriers. Future studies could further investigate the KAP condition regarding cancer screening and primary prevention among these specific groups. Fourth, most of the included studies focused only on cervical and breast cancers. Few similar studies have focused on lung, gastric, and rectal cancers, which are the three most commonly detected new cancer cases in China.[2] More research results are still needed about the KAP condition of ethnic minorities related to these high-incidence cancer types. Finally, only seven ethnic minority groups, namely Uyghur, Mongol, Hui, Kazakh, Korean, Tibetan, and Tujia, were investigated in the included studies. Studies of other ethnic minority groups, such as the Zhuang, Miao, Man, Yi, and Dong groups, are lacking, even though these account for 68.0% of all ethnic minority residents in China together with the Uyghur, Mongol, Hui, Tibetan, and Tujia groups.[4] Future studies could continue investigating and explore the results of the other ethnic minorities in mainland China to further build up a more comprehensive understanding.

Conclusions

Ethnic minorities in mainland China showed low levels of knowledge and practice regarding cancer screening and primary prevention but held moderately to highly positive attitudes, similar to the Han populations in this review. Low education levels, economic burdens, lack of access to professional medical services, language barriers, and acculturation may be the factors hindering KAP regarding cancer screening and primary prevention among ethnic minority groups in mainland China. More evidence regarding diverse ethnic minority groups, regions, and cancer types is needed to better depict the overall situation of cancer screening and primary prevention among ethnic minority groups in mainland China.

Ethics statement

Not required.

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CRediT authorship contribution statement

Zhao Wenqian: Conceptualization, Methodology, Formal analysis, Writing – original draft; So Winnie Kwok Wei: Conceptualization, Methodology, Supervision, Writing – review and editing; Li Huiyuan: Data curation, Writing – review and editing; Wong Cho Lee: Writing – review and editing. All authors had full access to all the data in the study, and the corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Declaration of competing interest

All authors have no conflicts of interest to declare. The two authors, Professor Winnie K.W. So, and Dr. Cho Lee Wong, serve as the editorial board members of the *Asia-Pacific Journal of Oncology Nursing*. The article underwent the standard review procedures of the journal, with the peer review process managed independently from Professor So and Dr. Wong and their research groups. The data that support the findings of this study are available from the corresponding author, Winnie K.W.SO, upon reasonable request.

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